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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
PYZOCHA, MICHAEL J	

ART UNIT	PAPER NUMBER
2137	

DATE MAILED: 12/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/822,775	JAVIDI ET AL.	
	Examiner	Art Unit	
	Michael Pyzocha	2137	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-14,17-59,62-72,75-84,88-90,113,114 and 143-160* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *143-160* is/are allowed.

6)☒ Claim(s) *1,4-14,17-28,30,46-49,54-59,62-72,75-84,88-90,113 and 114* is/are rejected.

7)☒ Claim(s) *29,31-45 and 50-53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1, 4-14, 17-59, 62-72, 75-84, 88-90, 113-114 and 143-160 are pending.

2. Response filed 11/16/2005 has been received and considered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 4, 8-14, 17, 21-28, 30, 46-47, 54-59, 62, 66-72, 75, 79-84, 113-114 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson in view of Yamaguchi et al (Phase-shifting digital holography) and further in view of Rentzepis et al (US 5325324).

As per claims 1, 4, 8, 14, 17, 21, 59, 62, 66, 72, 75, 79, Jackson discloses generating an original set of data; generating a reference set of data; encoding the original set of data; encoding the reference set of data; combining the original set of data with the encoded reference set of data to generate an

encrypted set of data; storing the encrypted set; and decrypting the set of data (see column 10 lines 40-57 and column 6 line 11 through column 7 line 4 and figures 2A, 2B, 5A and 5B) the encoding of the data comprises phase encoding (see column 10 lines 40-57 and column 6 line 11 through column 7 line 4).

Jackson fails to disclose the encoding of the data comprises phase encoding by introducing a random phase into the data and introducing the random phase using the equation:

$$U_R(x,y;\Delta\varphi_p) = A_R(x,y)\exp[i(\varphi_R(x,y)+\Delta\varphi_p)].$$

However Yamaguchi et al teaches such an equation (see page 1268) and Rentzepis et al teaches random phase encoding (see column 18 lines 29-42).

At the time of the invention it would have been obvious to a person of ordinary skill in the art for Yamaguchi et al's equation and Rentzepis et al's phase encoding to be used in the system of Jackson.

Motivation to do so would have been to be able to reconstruct a cross section with higher image quality (see Yamaguchi et al page 1268) and because random phase encoding is highly accurate (see Rentzepis et al column 18 lines 29-42).

As per claims 9-10, 22-23, 46-47, 57-58, 67-68, 80-81, the modified Jackson, Yamaguchi et al, and Rentzepis et al system

discloses recording the encrypted set of data in a hologram (see Jackson column 11 lines 10-28).

As per claims 12-13, 25-26, 70-71, 83-84, the modified Jackson, Yamaguchi et al, and Rentzepis et al system discloses the original and reference set of data comprises an optical image, a digitized image, a one dimensional set of data, a two dimensional set of data, a multi-dimensional set of data, an electrical signal or an optical signal (see Jackson column 11 lines 10-28).

As per claims 11, 24, 69, 82, the modified Jackson, Yamaguchi et al, and Rentzepis et al system discloses recording the encrypted set in a hologram according to the equation:

$$I_p(x,y) = [A_H(x,y)]^2 + [A_R(x,y)]^2 + 2A_H(x,y)A_R(x,y)\cos[\phi_H(x,y) - \varphi_R(x,y) - \Delta\varphi_p]$$

wherein p is an integer,

$$\phi_E(x,y) = \phi_H(x,y) - \varphi_R(x,y)$$

is the encrypted phase,

$$A_E(x,y) = A_H(x,y)A_R(x,y)$$

Is the encrypted amplitude $\Delta\varphi_P$ is a phase shift between the reference ser of data and the original set of data $[A_H(x,y)]^2$ is

the intensity of the original set of data and $[A_R(x,y)]^2$ is the intensity of the encoded reference set of data (see page 1268).

As per claims 27, 28, 30, 54-56 the modified Jackson, Yamaguchi et al, and Rentzepis et al system discloses generating decryption keys (see Jackson columns 9 and 10).

As per claims 113-114, the modified Jackson, Yamaguchi et al, and Rentzepis et al system discloses reconstructing the original set (see Jackson column 11 lines 10-28).

5. Claims 5-7, 18-20, 63-65, 76-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Yamaguchi et al, and Rentzepis et al system as applied to claims 1, 14, 59, 72 above, and further in view of Tan et al (Secure optical storage that uses fully phase encryption).

As per claims 5-7, 18-20, 63-65, 76-78, the modified Jackson, Yamaguchi et al, and Rentzepis et al system fails to disclose the encoding of the data comprises amplitude encoding by introducing a random amplitude into the data and introducing the random amplitude using the equation:

$$U_R(x,y;\Delta\varphi_p) = A_R(x,y)\exp\left[i\left(\varphi_R(x,y)+\Delta\varphi_p\right)\right].$$

However, Tan et al teaches amplitude encoding (see page 6689).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the encoding

techniques of Tan et al in the modified Jackson, Yamaguchi et al, and Rentzepis et al system.

Motivation to do so would have been that amplitude encoding is one of the degrees of freedom in which an optical beam may be encoded (see Tan et al page 6689).

6. Claims 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Yamaguchi et al, and Rentzepis et al system as applied to claim 47 above, and further in view of Schnars et al (Direct recording of holograms by a CCD target and numerical reconstruction).

As per claim 48, the modified Jackson, Yamaguchi et al, and Rentzepis et al system fails to disclose reconstructing of the original set of data from the decrypted digital hologram comprises generating the discrete complex amplitude distribution of the reconstructed original set of data from the equation:

$$U_O(m',n') = \exp\left[\frac{-i\pi}{\lambda d}\left(\Delta x'^2 m'^2 + \Delta y'^2 n'^2\right)\right]\sum_{m'=0}^{N_x-1}\sum_{n'=0}^{N_y-1} U_D(m,n) \times \exp\left[\frac{-i\pi}{\lambda d}\left(\Delta x^2 m^2 + \Delta y^2 n^2\right)\right]\exp\left[-i2\pi\left(\frac{m'm}{N_x}+\frac{n'n}{N_y}\right)\right]$$

wherein $U_D(m,n)$ is the discrete amplitude distribution of the decrypted digital hologram, m and n are coordinates in the plane of the hologram, m' and n' are coordinates in the reconstruction plane, Δx is the horizontal resolution in the hologram plane, Δy is the vertical resolution in the hologram plane, $\Delta x'$ is the horizontal resolution in the reconstruction plane, $\Delta y'$ is vertical resolution in the reconstruction plane, N_x is the number of detector pixels in the x direction and N_y is the number of detector pixels in the y direction.

However, Schnars et al teaches such a limitation (see page 180).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to reconstruct the modified Jackson, Yamaguchi et al, and Rentzepis et al system's information as in Schnars et al.

Motivation to do so would have been to allow for a discrete reconstruction (see page 180).

7. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Yamaguchi et al, and Rentzepis et al system as applied to claim 46 above, and further in view of Kitayoshi (US 5974178).

As per claim 49, the modified Jackson, Yamaguchi et al, and Rentzepis et al system fails to disclose reconstructing a segment of the original data.

However, Kitayoshi teaches such a method (see columns 4 and 5).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to reconstruct the modified Jackson, Yamaguchi et al, and Rentzepis et al system's data using segments.

Motivation to do so would have been to allow for faster computational holography (see column 4 lines 27-31).

8. Claims 88-90, are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson alone or in combination with Tan et al as applied to claims 10, 23, 81, above, and further in view of Ladino ("Data Compression Algorithms").

As per claims 88-90, the modified Jackson, Yamaguchi et al, and Rentzepis et al system discloses distributing the hologram to remote locations (see Jackson column 11 lines 10-28).

The modified Jackson, Yamaguchi et al, and Rentzepis et al system fails to disclose compressing and decompressing the hologram on respective ends of the transmission.

However, Ladino discloses compression of data (see pages 1-6).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Ladino's method of data compression to compress the holograms of the modified Jackson, Yamaguchi et al, and Rentzepis et al system.

Motivation to do so would have been that compressed data uses less space (see Ladino page 2).

Response to Arguments

9. Applicant's arguments with respect to claims above have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

10. Claims 29, 31-45, 50-53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Regarding claims 29, 31-37, 40-45, the prior art teaches generating decryption keys for this type of system, but not the specific keys of claims 29 and 31. Claims 32-37 and 40-45 depend on either claim 29 or 31.

12. Regarding claims 38-39, the prior art teaches $\phi_E(x,y) = \arctan\left(\frac{I_4 - I_2}{I_1 - I_3}\right)$ as seen in Yamaguchi et al, but fails to teach the specific equation $A_E(x,y) = \frac{1}{4}\left[(I_1 - I_3)^2 + (I_4 - I_2)^2\right]^{1/2}$.

13. Regarding claims 50-53, the prior art teaches reconstruction using segments but fails to teach the specific segment defined by the rectangle described in claim 50. Ford et al "Array interconnection by phase-coded optical correlation" teaches the use of the rectangle function within the art, but not within the context of claim 50. Claims 51-53 are dependent from claim 50.

14. Claims 143-160 allowed based on placing previously presented claims 29, 31, and 50 in independent form with claims, which depend from them. Reasons for allowance were given in the previous action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Pyzocha whose telephone number is (571) 272-3875. The examiner can normally be reached on 7:00am - 4:30pm first Fridays of the bi-week off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emmanuel Moise can be reached on (571) 272-3865. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJP

EMMANUEL L. MOISE
SUPERVISORY PATENT EXAMINER